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(51) INT CL<sup>7</sup>

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(52) UK CL (Edition S )

E2A AGB AGMA  
A1E EAD

(56) Documents Cited

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GB 1076254 A	GB 0929703 A	EP 0021960 A2

(58) Field of Search

UK CL (Edition R ) A1E EAD , E2A AAN ACAT ACMG  
AGB AGKFJ AGMA AGRX  
INT CL<sup>7</sup> A01G 9/12 , A44B 11/20 11/25 , F16B 2/08  
2/26

Online: EPODOC, WPI, PAJ

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(54) Abstract Title

**Flexible tie**

(57) A flexible garden tie (10) has pad portions (11,12) joined by a strip portion (13). The pad (11) has studs (14) at its opposite ends and the pad (12) has openings (15) similarly distributed to accept the studs (14) as a friction fit. The tie (10) may be folded and a cane or the like engaged between the pads (11,12) or another tie may be secured end-to-end by inserting its studs (14) in the openings (15) of the first tie, or in an overlying relationship in which studs (14A) extending half way along one strip portion (13) engage openings (15A) extending half way along the other strip portion.

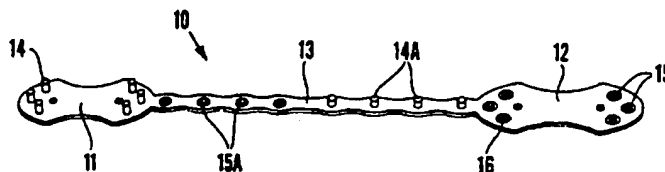


Fig. 1

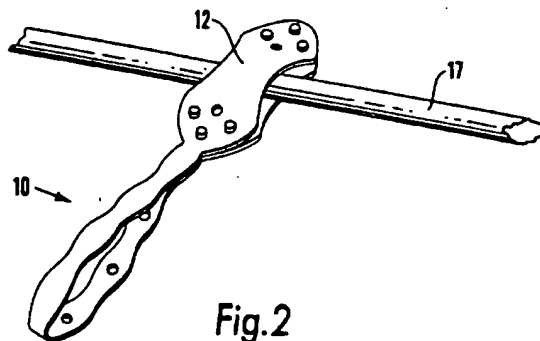


Fig. 2

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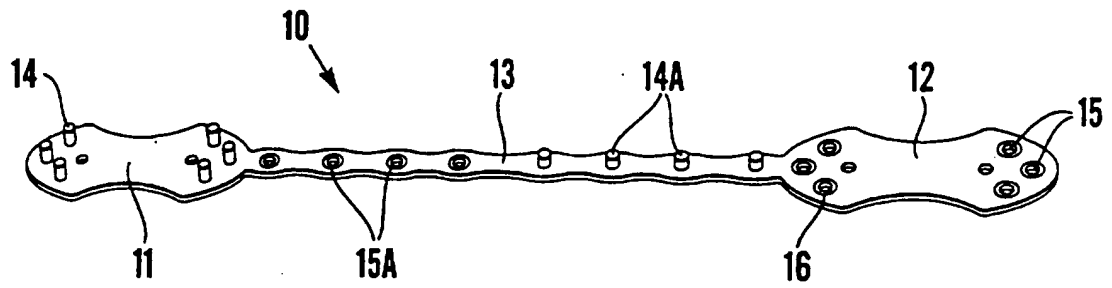


Fig. 1

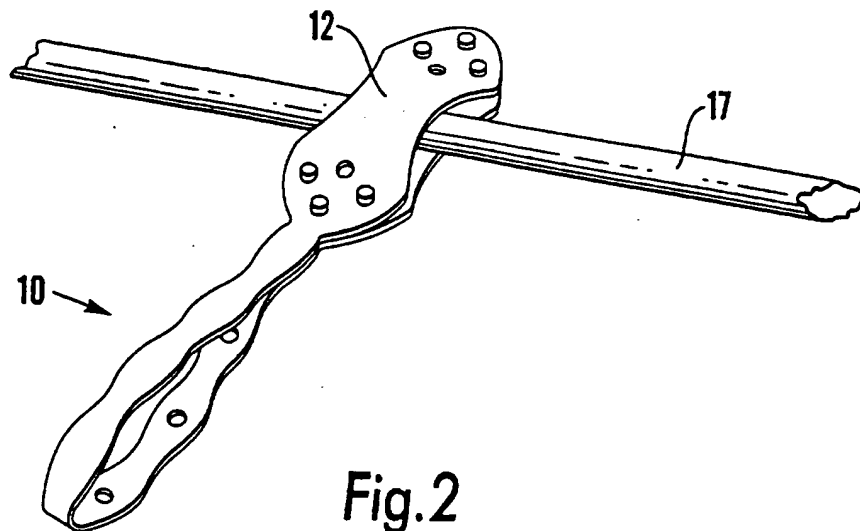


Fig. 2

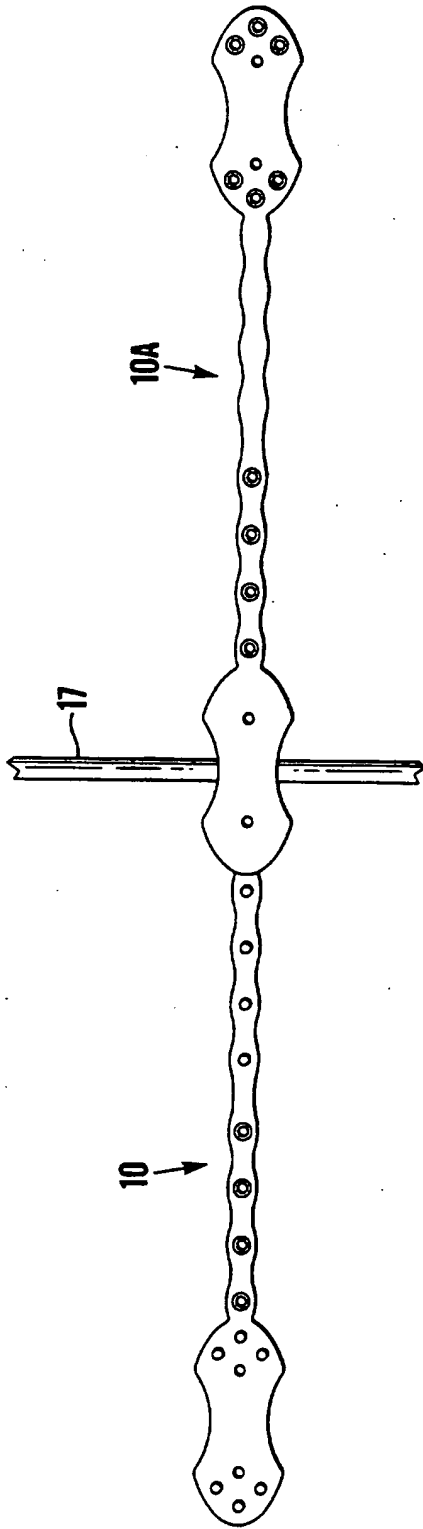


Fig. 3

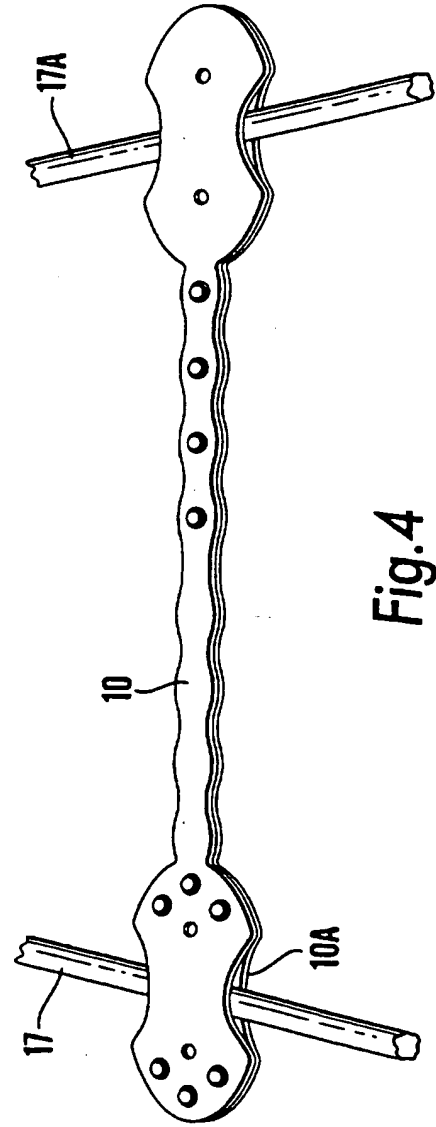


Fig. 4

**"TIE"**

This invention relates to a garden tie of improved versatility. By a "garden tie" is meant a flexible, elongated element primarily, but not exclusively, intended for supporting plants

In accordance with the present invention there is provided a tie of flat, flexible material comprising two pad portions of similar configuration joined by a relatively narrow strip portion, wherein the pad portions have respectively interengageable male and female formations which have a similar distribution on the pads such that the pads may be joined together by bending the strip portion or alternatively the male or the female formations may be engaged by the female or the male formations of another, similar tie so that the two ties are joined end-to-end.

The strip portion may additionally have male and female formations distributed along its length. Male formations may extend along one half of the length of the strip portion and a corresponding number of correspondingly positioned female formations may extend along the other half of the length of the strip portion such that when bent in the middle the two halves of the length of the strip portion may be secured together.

The male formations may be studs upstanding from one surface of the respective pad and the female formations may be openings in the other pad, each stud fitting a corresponding opening as a friction fit.

Each opening may be surrounded by an annular rebate.

The male and female formations are preferably grouped at opposite ends of the respective pad such that when one pad is brought to overlies the other the two pads may be joined at their opposite ends while allowing central areas of the pads to pass on opposite sides of an element between the pads.

Several male or female formations may be arranged in an arcuate pattern at each end of the respective pad.

A preferred embodiment of the invention will now be described by way of non-limitative example with reference to the accompanying Drawings, in which:

Figure 1 is a perspective view of a tie in accordance with the invention,  
 Figure 2 shows the tie of Figure 1 engaging a cane between its pads,  
 Figure 3 shows two ties similar to that of Figures 1 and 2 joined end-to-end, and  
 Figure 4 shows two ties similar to those of Figure 3 but in an overlapping relationship.

The tie 10 of Figure 1 is an elongated, flat, flexible element of polypropylene, preferably of a non-degradable green colour for use in the garden. The tie has two similarly shaped pad portions 11 and 12 joined by a strip portion 13. The pad 11 has upstanding from one of its surfaces six studs 14 arranged in two arcuate patterns of three at opposite ends of the pad. The pad 12 is formed with six openings 15 which have a similar distribution on pad 12 as do the studs 14 on pad 11. At the surface of the tie from which the studs 14 project each opening 15 is surrounded by an annular rebate 16. The provision of these rebates thins the material of the tie around each opening 15 and makes for better frictional engagement with the studs. Each stud 14 is dimensioned to be a friction fit within each opening 15.

Studs 14A similar to the studs 14 are distributed along the length of the half of the strip portion 13 which is adjacent to the pad 12. Openings 15A are distributed along the length of the half of the strip portion 13 which is adjacent to the pad 11.

Figures 2-4 exemplify, by no means exhaustively, possible uses of the tie of the invention. In Figure 2 a cane 17 is engaged between the pad portions 11 and 12 of the same tie. The studs 14 on pad 11 each engage the corresponding opening 15 in the pad 12. The central, strap-like regions of the pads bend around the cane and will grip it sufficiently tightly to resist sliding along the cane. This is in contrast to string which, however tightly knotted, will tend to run down a vertical cane under the weight of a plant being supported. The strip portion 13 of the tie is free to surround a plant (not shown) being supported by cane 17.

In Figure 3 two ties 10 and 10A are joined end-to-end by engaging the studs 14 on pad 11 of one tie with the openings 15 of pad 12 of the other tie. A cane 17 may be gripped between the engaged pads of the two ties.

In Figure 4 the two ties 10 and 10A overlies one-another and canes 17 and 17A are gripped between the overlapping pads of the ties. In this case, because the ties 10 and 10A are inverted relative to one-another the studs 14A on the strip portion 13 of one tie may engage the openings 15A of the strip portion 13 of the other tie, giving a relatively rigid construction.

Of course the ties may be used to grip elongated elements other than canes, such as portions of a trellis. The ties may also be used to connect to canes, trellises, plant stems or tree branches decorative features other than plants, such as fairy lights.

## CLAIMS:

1. A tie of flat, flexible material comprising two pad portions of similar configuration joined by a relatively narrow strip portion, wherein the pad portions have respectively interengageable male and female formations which have a similar distribution on the pads such that the pads may be joined together by bending the strip portion or alternatively the male or the female formations may be engaged by the female or the male formations of another, similar tie so that the two ties are joined end-to-end.
2. A tie as claimed in claim 1, wherein the strip portion additionally has male and female formations distributed along its length.
3. A tie as claimed in claim 2, wherein male formations extend along one half of the length of the strip portion and a corresponding number of correspondingly positioned female formations extend along the other half of the length of the strip portion such that when bent in the middle the two halves of the length of the strip portion may be secured together.
4. A tie as claimed in any one of the preceding claims, wherein the male formations are studs upstanding from one surface of the respective pad and the female formations are openings in the other pad, each stud fitting a corresponding opening as a friction fit.
5. A tie as claimed in claim 4, wherein each opening is surrounded by an annular rebate.
6. A tie as claimed in any one of the preceding claims, wherein the male and female formations are grouped at opposite ends of the respective pad such that when one pad is brought to overlies the other the two pads may be joined at their opposite ends while allowing central areas of the pads to pass on opposite sides of an element between the pads.
7. A tie as claimed in claim 5, wherein several male or female formations are arranged in an arcuate pattern at each end of the respective pad.
8. A tie substantially as hereinbefore described with reference to and as shown in the accompanying Drawings.



Application No: GB 0016698.3  
Claims searched: 1-8

Examiner: Philip Silvie  
Date of search: 29 September 2000

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK Cl (Ed.R): A1E (EAD); E2A (AAN, ACAT, ACMG, AGB, ACMG, AGKFJ, AGRX)  
Int Cl (Ed.7): A01G 9/12; A44B (11/20, 11/25); F16B (2/08, 2/26)  
Other: Online: EPODOC, WPI, PAJ

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2 209 111 A (WEISS) see fig. 1	1 at least
X	GB 1 376 572 A (KOHSHOH) see fig. 10	1 at least
X	GB 1 196 366 A (ROSS COURTNEY) see figs. 1,2	1 at least
X	GB 1 076 254 A (ROBINSON) see figs. 2-4	1 at least
X	GB 0 929 703 A (ILLINOIS) see figs. 1,2	1 at least
X	EP 0 021 960 A2 (TECNIFLORE) see fig. 1	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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G1N NAHJA N3S9  
G4D DDF D401 D411 D423

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(58) Field of Search

UK CL (Edition R ) G1N NAHJA , G4D DDF , H4L LCAX  
LCC LCE LCL LCR LCT LCX LDA  
INT CL<sup>7</sup> G01D 4/00 , G06M 1/274 , G08C 17/00 17/02  
17/04  
Online Databases: WPI, EPODOC, JAPIO

(54) Abstract Title

**Radio frequency and inductive meter reader**

(57) A hand-held meter reader for reading utility meters such as gas, water or electricity meters can receive data by radio frequency transmission from a meter and can also receive data inductively from a meter, thus allowing it to read many types of meter. The reader can communicate using a variety of protocols. The reader may automatically switch between radio and inductive reading. The reader may transmit a signal which causes all meters in range to transmit data in a time staggered manner, in turn according to ID number or according to a generated random number. The reader may interrogate selected meters by transmitting an identification number in the interrogation signal. An RF link to a computer for downloading data may also be provided. The computer may be in a vehicle and the meter reading route may be stored in the computer which then provides information on the next meter to be read to the reader. The route may alternatively be stored in the reader.

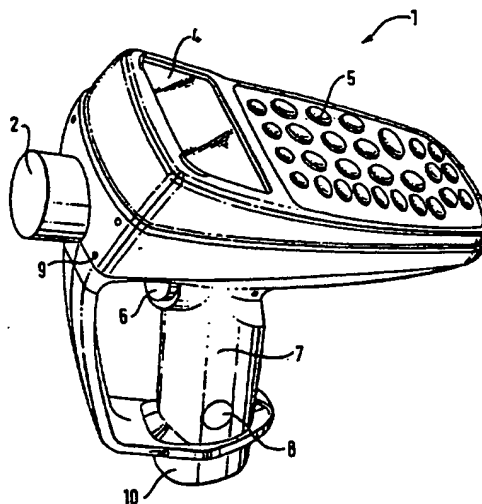


FIG. 1

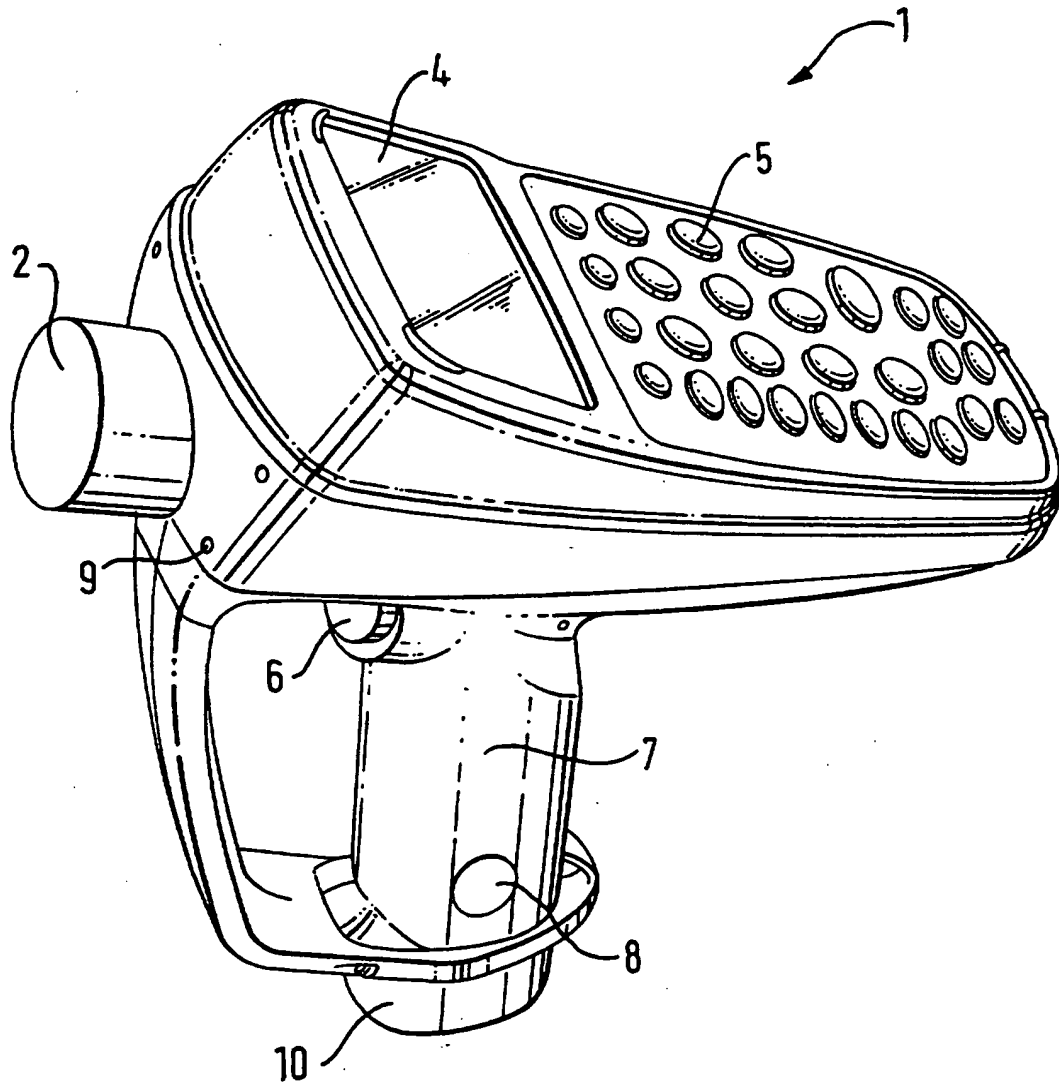


FIG. 1

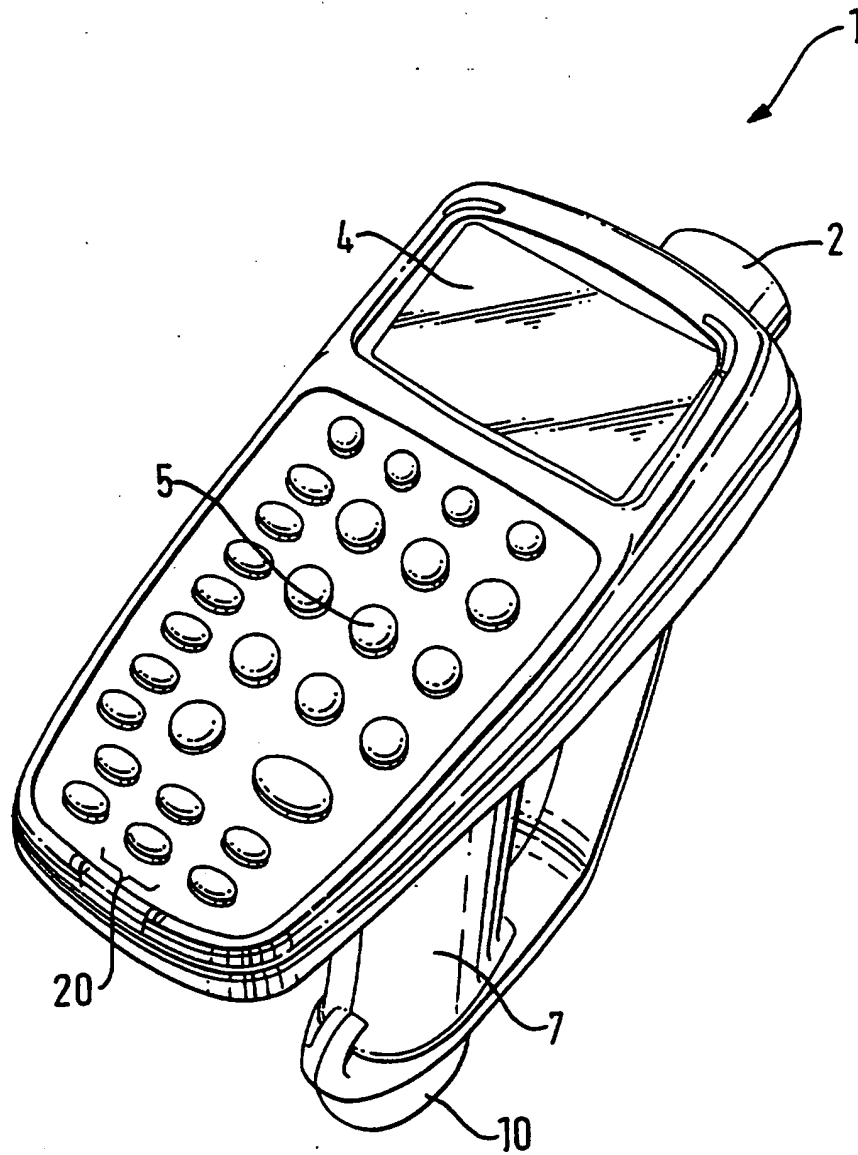


FIG. 2

METER READER

This invention relates to a reader for a meter, and more specifically, although not exclusively, to a hand-held reader for a utility meter, particularly a water meter.

A wide variety of utility meters are known for measuring the supply of utilities, for example, gas, water and electricity. The measurement of utility supply allows each consumer to be charged according to the level of their use of the supply and discourages wasting of natural resources.

Although utility meters are, in general, provided with a display for displaying the level of utility consumption, the meters may often be located in inaccessible places. To facilitate the ease of reading the meter there is often a remote reading device provided. This may be a pad coupled to the meter through a wire link, or alternatively a radio frequency (RF) module. For a pad, the meter is read by electromagnetic inductive coupling through the pad with a reader device (in close proximity to the pad). For an RF module, the meter is read using radio frequency transmission (usually having a maximum range of about 90-400 metres) to transmit the utility usage data to a reader device having a suitable RF module.

Numerous utility meters are commercially available, and each may be provided with either a pad or an RF module for remote reading. In addition, the form of the data transmitted, specifically the data communication

protocols, varies with each meter. This makes it difficult to provide a reading device which is able to read all the different possible meter types.

It is an object of the present invention to seek to mitigate these disadvantages.

According to the present invention there is provided apparatus for reading a meter, comprising means for receiving data by radio frequency transmission from the meter, and means for inductively receiving data from the meter.

The apparatus may include an algorithm to determine the form of the incoming data from the initial portion of an incoming data stream. This scheme of meter reading is described in GB 2 277 392, which is hereby incorporated by reference. Once the form of the incoming data has been recognised then the data can be successfully received.

Prior art apparatus has employed a list of possible protocols for the data. The incoming data is examined using sequential trial reading, progressing through the list after each failure to recognise the data. This method may involve receiving the same data four or five times before it is correctly decoded. The use of the algorithm described above results in a faster read time for each meter, since the data protocols are determined from the initial portion of incoming data.

The algorithm may conveniently compare the first ten bits of an incoming data stream with a stored list of known protocols.

The meter may be a utility meter, such as a water meter.

Embodiments will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a first perspective view of a meter reader according to the present invention, and

Figure 2 shows a second perspective view of the meter reader.

A reader 1 is shown in Figures 1 and 2. The reader 1 comprises a nozzle 2, an RF module (not visible), a display 4, a keypad 5, a trigger switch 6, a handle 7, a communication port 8 and a battery charging interface 9. The reader also includes a memory and a microprocessor (not visible).

The nozzle 2 contains a coil (not shown), and is used to read a water meter through a pad connected by wire to a water meter. The meter reading is carried out by inductive coupling between the nozzle 2 and the pad. When the trigger switch 6 is operated an interrogation signal is applied to the coil which is inductively coupled to a coil in the pad. After the pad has received the interrogation signal it causes the meter reading to be generated as a data signal in the pad coil, which signal is transferred by the inductive

coupling to the coil in the reader, and from that coil to the microprocessor in the reader.

The shape and configuration of the nozzle 2 are such that all known pads may be read. The nozzle 2 is replaceable, and may be easily swapped for a new nozzle should it sustain damage or if future developments result in a different design.

The reader 1 is able to read any water meter known to the applicant at the time of filing this patent application, even though different manufacturers' meters send data in different formats. When the first portion of incoming data is received by the reader 1 the software will examine the first few (about ten) bits of data to determine the format of the data, and hence the applicable data communication protocols. When this determination has been made the meter may then be read and interpreted successfully. This scheme of meter reading is described in GB 2 277 392.

The RF module allows the reader 1 to read water meters using RF transmission. All known water meters known to the applicant at the time of filing this patent application fitted with a suitable RF module may be read.

Combining the inductive read nozzle 2 and the RF module into a single reader 1, in combination with software which determines the make of the meter, allows a larger number of water meters to be read.

The user does not have to know in advance which type of reading method is required in order to switch the reader 1 into the correct mode. Instead, a meter reading route may be programed in advance into the reader 1. The programed route will include information about the type of reading to be made at each location and will switch the reader into the correct reading mode (inductive/RF) automatically, or will indicate to the user that manual keyword entry is required. The meter reading is initiated by the user pressing the trigger 6.

The programed route may include data indicating what the expected reading should be at each location. If the actual reading is significantly different, the probe will automatically prompt the user to investigate for tampering, etc.

An LED 20 on the front of the reader indicates to the user the status of the meter reading. Red may indicate that the reading has been unsuccessful, amber may indicate that the reading is in progress, and green may indicate further reading has been successfully completed. A different audible signal is produced in each of these states. The LED and audible signals are in addition to status information appearing on display 4. Providing status indications in a number of forms is advantageous because the pad for obtaining the meter reading may be in a difficult to access position. The display 4 may be obscured. It may be noisy so that the audible signal cannot be recognised by the user.

The memory is used to store readings until they are downloaded. The user may also use the keypad to input meter readings or further information to accompany the meter readings. The microprocessor includes a real time clock which is used to time and date stamp all readings. Up to 4000 readings can be stored.

The communication port 8 is an RS-232 data port which can be used to provide direct electronic connection between the reader 1 and, for example, a computer. This may be used to download stored meter readings into the computer or to program a meter reading route into the reader 1. Software upgrades for the reader 1 may also be performed through the port, for example this could allow the operating system to be upgraded externally without having to replace the processor.

The display 4 is a high resolution liquid crystal display, suitable for displaying data from a meter reading, instructions to the user, or graphical information.

The RF module includes a bi-directional radio and is provided with a number of different possible functions. The first mode of operation involves the RF module transmitting a signal which causes water meters in range to begin transmitting. A large number of nearby water meters (each having an RF module) will usually respond, transmitting their data. This data includes the meter's individual identification number and the meter reading. The meters transmit data in a time-staggered manner, so that the data from each meter is received at a different time. Transmission could be

delayed according to each meter's ID number, according to a value from a random number generator, or according to a meter's ID number multiplied by a value from a random number generator. The RF module in the reader 1 may have to receive a large number of responses, for example from 400 water meters, and will store these in memory.

A second mode of operation for the RF module is two-way transmission, which allows the reader 1 to interrogate a specific water meter. This mode is especially useful if during the first mode of operation the reader 1 fails to record or distinguish one of the incoming transmissions. The RF module will transmit a specific signal, which includes the identification number for the nominated water meter. All nearby water meters will receive the transmission, but only the one which has the relevant identification number will respond, transmitting data to the reader 1.

A third mode of operation for the RF module provides a RF link between the reader 1 and a computer. The computer may be located, for example, in a vehicle of the user when he is carrying out a number of meter readings. The meter readings can be downloaded to the computer through the RF link as an alternative to using a direct data link through the port 8. This may be done automatically by the reader 1 if the memory storage is almost full. Also, if the meter reading route is stored in a computer instead of in the reader 1 then the reader 1 can be provided with information about the next meter reading through the RF link.

The data is downloaded in CDT (Common Delimited Test) format. Data may be selectively downloaded. The reader is capable of reading data at two or more frequencies. This allows a wider variety of meters to be read by the probe.

The reader 1 includes a power source, provided by a battery 10 in the handle 7. This may be recharged through the battery charging interface 9 or may be replaced.

The keypad 5 and software run by the reader 1 may allow for personalisation of the reader. For example the reader could request entry of a username and password.

The reader may also include a means which allows an appropriately configured pad or meter to be programed via a signal from the nozzle 2. The reader can alter the serial number of a meter or may reset the meter count.

The probe described above is the most complex ... embodiment. The probe would be provided with less memory (to store, for example, 10-100 readings). In this instance "a hand-held" computer would also be carrier by the user and readings would be transmitted by cable or radio to the hand-held computer. The reader provides the user with a menu allowing him or her to configure the output for different types of hand-held computer.

The probe (or a hand-held computer, if one is connected) may provide a menu and means that allow the

user to set which type of meters are to be read. If the list of meters is restricted, the meters can be read more quickly because the algorithm (from GB 2 277 392) will need to test for fewer data types.

The reader may be used with the meter described in United Kingdom patent application number 9912561.9 which is hereby incorporated by reference.

CLAIMS

1. Apparatus for reading a meter, comprising means for receiving data by radio frequency transmission from the meter, and means for inductively receiving data from the meter.
2. Apparatus according to claim 1, wherein means is provided to automatically switch between radio and inductive reading.
3. Apparatus according to claim 1 or 2, wherein the meter is a utility meter.
4. Apparatus according to claim 3, wherein the meter is a water meter.
5. Apparatus according to any one of the preceding claims, comprising a keypad for data entry.
6. Apparatus according to any one of the preceding claims, comprising a memory for storing a plurality of meter readings.
7. Apparatus according to any one of the preceding claims, comprising a data display.
8. Apparatus according to any one of the preceding claims, comprising a communication port.
9. Apparatus according to any one of the preceding claims, comprising an RF module for transmitting a signal which causes meters in range to begin

transmitting, and means for receiving and storing the transmitted data.

10. Apparatus according to any one of the preceding claims, comprising an RF module for interrogating a selected water meter by transmitting a signal which includes the identification number for the nominated water meter.
11. Apparatus according to any one of the preceding claims, comprising an RF module for providing an RF link to a computer for downloading readings to the computer.
12. Apparatus substantially as hereinbefore described with reference to and/or substantially as illustrated in the drawing.



Application No: GB 0012963.5  
Claims searched: All

Examiner: Gareth Griffiths  
Date of search: 22 November 2000

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK CI (Ed.R): G1N(A) (NAHJA), G4D (DDF), H4L (LCAX, LCC, LCE, LCL, LCR, LCT, LCX, LDA)  
Int CI (Ed.7): G01D 4/00, G06M 1/274, G08C 17/00, 17/02, 17/04  
Other: Online Databases: WPI, EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X, Y	US5619192 (AYALA) col.2 line 65 - col.3 line 15 & col.3 line 60 - col.4 line 7	X: 1-7, 11 Y: 9,10
Y	US3656112 (PAULL) abstract & col.2 line 65 - col.3 line 27	Y:10
Y	JP100188190 A (NEC) see WPI & PAJ abstracts	Y:9
Y	JP080273088 A (AICHI TOKEDI) se WPI & PAJ abstracts	Y:9, 10

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.